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ABSTRACT

This study sought to determine the relations between generative teaching and student teachers' social maturity, receptivity to criticism, and ability to incorporate suggestions about their performance into their teaching. Profiles of "more effective" and "less effective" student teachers were compared with respect to generative teaching and personality characteristics. Participants were 97 elementary student teachers. The Generative Teaching Scale was developed, containing 21 items that measure preactive generative teaching behavior (instructional planning) and interactive generative teaching practices designed to promote students' generation of meaning from instruction. Results indicated that: (1) effective teaching strongly and positively related to ability to use generative teaching principles; and (2) effective generative teaching strongly and positively related to student teachers' social maturity, receptivity to criticism, and ability to incorporate suggestions from critiques into their teaching. Recommendations for teacher preparation and teacher selection are offered. (Contains 22 references.) (JDD)

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Generative Teaching and Personality Characteristics of Student Teachers

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Generative Teaching and Personality Characteristics of Student Teachers

The primary purpose of this study was to determine the relations between generative teaching and student teachers' social maturity, receptively to criticism, and ability to incorporate into their teaching suggestions from critiques of their performance. Additionally, the profiles of "more effective" and "less effective" student teachers were compared with respect to generative teaching and the above personality characteristics.

Generative teaching has been developed and frequently empirically tested in elementary and secondary schools over the last twenty years in reading (Wittrock, Marks, & Doctorow, 1975; Wittrock, 1990, 1981), economics (Kourilsky & Wittrock, 1987, 1992), science (Osborne & Wittrock, 1985, 1983), and mathematics (Peled & Wittrock, 1990). In these subjects generative teaching substantially increases student learning.

The model of generative teaching is a functional model, not a structural model such as schema theory. As a functional model of learning and teaching, generative teaching focuses on the cognitive and neural processes that learners use to comprehend concepts, and upon the

teaching and instructional procedures useful for increasing comprehension (Wittrock, 1992). The model states that the processes of understanding new concepts involve active learner generation of two types of meaningful relations. The first type of generated meaningful relation is between information to be learned and learner knowledge and experience (e.g., in instructional planning the teacher leads the students to relate subject matter presented in class to their previous knowledge base). The second type of meaningful relation is among the parts of the information to be learned (e.g., During instruction the teacher provides ample opportunity for the learners to generate their own summaries, explanations, analogies, etc., of the material presented in class).

The model of generative teaching builds upon research that goes beyond generation as a process of conceptual change to include motivation, attribution, attention, and metacognition (Wittrock, 1992). Generative teaching involves a distinctive type of learner motivation--taking responsibility for learning, bearing the consequences of one's learning decisions, and sustaining the internal belief that one can succeed at understanding complex everyday situations through

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actively generating and testing concepts. Cognitive research demonstrates that a student's belief that success in school is possible comprises one of the most important factors of school achievement (Coleman et al., 1966; Brookover, Beady, Flood, & Wisenbaker, 1977). The extensive research on attribution for learning, e.g., Weiner (1979), on teacher expectations and the so-called self-fulfilling prophecy, e.g., Cooper and Good (1982), on self-regulation and seli-efficiency, e.g., Pintrich and De Groot (1990), on learned helplessness, e.g., Dweck (1975) and on responsibility and consequence bearing, e.g., Kourilsky (1985), indicates the importance of the motivation and attribution component of the generative model of teaching.

Additionally, voluntary sustained attention focused on the construction of meaningful explanations and useful conceptualizations represents a centrally important component of generative learning. Questions and objectives exemplify facilitative strategies for meaningfully directing attention of learners (Wittrock, 1992).

Student awareness and control of over their own thought processes--metacognition--enhances learning. Students can be taught to use and to monitor their own

learning strategies, comprehension strategies, and attention directing strategies to attain a better understanding of their world and an enhanced ability to solve everyday problems (Douglas, Parry, Martin, & Garson, 1976; Swanson, 1990).

In sum, the generative model of learning and teaching consists of four functional cognitive processes directly relevant to instructional planning (i.e., preactive decision-making) and classroom teaching (the interactive decision-making of teachers). These processes include: (1) generation; (2) motivation/attribution; (3) attention; and (4) metacognition.

The authors have found that when they teach principles of generative teaching, student teachers usually can articulate and explain these principles, but often they cannot effectively apply them. There still exists a great disparity between "knowing" and "acting" upon these principles, both in preactive decision-making and interactive decision-making. Some of the student teachers who score well on written tests of knowledge of generative principles are ineffective in using these same principles and other research-informed instructional principles in their classroom teaching. Additionally, these student teachers tend during

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feedback conferences to refute the suggestions for improvement given by their supervisors, and to offer elaborate explanations and excuses for the absence of "desired practices" not prevalent in their lessons. These observations have led the authors to speculate that generative teaching increases in effectiveness when student teachers, in addition to being intellectually capable, are socially mature, receptive to criticism, and able to incorporate feedback into their subsequent lessons. Thus the following hypotheses were tested:

(1) Student teachers' social maturity, receptivity to criticism, and ability to incorporate suggestions resulting from critiques into their subsequent teaching predict the effectiveness of generative teaching both in preactive decision-making (planning the lesson) and in interactive decision-making (executing the lesson).

(2) More effective student teachers exhibit a greater level of social maturity, receptivity to criticism, ability to incorporate criticism into subsequent teaching, generative teaching in the preactive domain, and generative teaching in the interactive domain than do the "less effective" student teachers.

Method

Participants

The participants were 97 elementary student teachers. The information deemed essential to this study was collected when the subjects were Master of Education Degree/California Multiple Subject Teaching Credential candidates in the Teacher Education Laboratory (TEL) at the University of California at Los Angeles. An attempt was made to gather data on all elementary school teachers in the 1991 TEL program. Consequently, no sampling techniques were used for the selection of subjects for this study.

The participants maintained a grade point average of at least 3.0 throughout the TEL's fifth year preservice teacher education program. To be admitted to this program the subjects met the following minimum criteria in addition to meeting subjective evaluations, through interviews: undergraduate grade point averages of at least 3.0; combined verbal and quantitative Graduate Record Examinations Scores of 1000; passing scores on the California Basic Educator's Skill Test (CBEST); and either the successful completion of an approved undergraduate diversified liberal arts program

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or a high percentile score on the General Knowledge portion of the National Teachers' Examination (NTE).

Instruments

Based on the model of generative teaching, an original list of 40 items was designed by Kourilsky, Esfandiari, and Wittrock (1991) to evaluate the use of the theory and principles of generative teaching in the student teacher's preactive (lesson planning) and interactive (lesson execution) teaching behavior. The semantic differential technique, developed by Osgood (1975), was used to evaluate each item.

As discussed previously, nearly all of the student teachers understand the principles of generative teaching but many of them do not incorporate them in their actual planning and teaching. Thus, a major goal was to design a scale that measured student teachers effective use of the principles of generative teaching in their lesson planning and lesson execution. To construct this scale, the authors conducted an exhaustive search of the bipolar adjectives suggested by Osgood (Osgood, 1975; Triandis, 1971) and compiled an original list of 20 bipolar adjectives. To attain the main goal of the study, the authors chose four bipolar adjectives that showed whether the student teachers used

the generative teaching principles at all (existing-nonexisting), and if they did use them, how often (frequent-seldom), and with what level of strength (strong-weak) and skill (skillful-unskillful) they used each principle.

To complete the instrument and also to increase its content validity, comments and criticisms on the original draft of the instrument (the 40 items and the four bipolar adjectives) were solicited from 20 teacher education experts who were familiar with the generative teaching model. Each reviewer was asked to comment on the suitability of the four bipolar adjectives as well as to determine if each item assessed the four dimensions of generative teaching: generation, using prior knowledge and experience of the learner; motivation/attribution; attention; and metacognition. More than 90% of the reviewers found the bipolar adjectives to be sensitive, exhaustive, and accurate measures of generative teaching behavior.

On the basis of the reviewers' written feedback, the authors completed the instrument, **Generative Teaching Scale**. This scale consists of 21 items. Each item is rated on four bipolar scales (existing-nonexisting, frequent-seldom, strong-weak, skillful-

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unskillful), each of which measures a distinctive quality or dimension of preactive and interactive generative teaching. The authors also sought to ensure that the items were not biased to reflect unintended measures of social desirability.

Six of the items on the Generative Teaching Scale, such as the first two examples presented below, pertain specifically to instructional planning or preactive generative teaching behavior. Fifteen of the items, such as the third and fourth examples presented below, measure interactive generative teaching practices designed to promote students' generation of meaning from instruction.

(1) In instructional planning the teacher relates the subject matter presented in class to the previous knowledge base of the learners (moves from familiar to unfamiliar).

existing	7	6	5	4	3	2	1	nonexisting
frequent	7	6	5	4	3	2	1	seldom
strong	7	6	5	4	3	2	1	weak
skillful	7	6	5	4	3	2	1	unskillful

(2) In designing instructional objectives the teacher selects strategies that takes the students' learning styles into account.

existing	7	6	5	4	3	2	1	nonexisting
frequent	7	6	5	4	3	2	1	seldom
strong	7	6	5	4	3	2	1	weak
skillful	7	6	5	4	3	2	1	unskillful

(3) During the lesson, the teacher encourages the students to generate summaries and causal relations in their own words.

existing	7	6	5	4	3	2	1	nonexisting
frequent	7	6	5	4	3	2	1	seldom
strong	7	6	5	4	3	2	1	weak
skillful	7	6	5	4	3	2	1	unskillful

(4) During the lesson the teacher encourages the lower achieving students (lower 1/3) in this class to actively engage in classroom learning activities.

existing	7	6	5	4	3	2	1	nonexisting
frequent	7	6	5	4	3	2	1	seldom
strong	7	6	5	4	3	2	1	weak
skillful	7	6	5	4	3	2	1	unskillful

The scores on each item ranged from 4 to 28. The scores were computed by adding the ratings on the four

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bipolar scales. The preactive scores ranged from 24 to 168, and the interactive scores ranged from 60 to 420. The higher the scores in these two domains, the greater the generative principles are reflected in the prospective teachers' instructional planning and actual classroom teaching.

The reliability of the instrument was determined by calculating Cronbach's alpha. Cronbach's alpha estimates for the preactive and the interactive scores were .96 and .98 respectively.

For purposes of comparison and performing different types of statistical analyses, the interactive and preactive scores were transformed to a scale of 100.

Procedure

At the end of the student teaching assignment, each subject's preactive and interactive generative teaching was rated by two Clinical Consultants. Each subject's social maturity, receptivity to criticism, and ability to incorporate criticism were also evaluated by the Clinical Consultants on a five point scale. The scores assigned by the two clinical consultants were averaged. The interater reliability was 0.91 on social maturity, 0.85 on receptivity to criticism, 0.83 on ability to incorporate criticism into subsequent teaching, 0.84 on

preactive generative teaching, and 0.85 on interactive generative teaching.

The clinical consultants were graduate students in teacher education who have had a minimum of 10 years of classroom K-12 teaching experience. They act as teaching assistants who observe and give feedback to each of their student teachers a minimum of four times during a student teaching assignment. Each student teacher is assigned two clinical consultants during the student teaching experience.

The four full-time university supervisors of elementary student teachers were asked to meet with each other and to rank each of the 97 student teachers in quartiles (top 25% to bottom 25%) in terms of their overall teaching effectiveness. The raters could use any criteria of effectiveness that they found appropriate so long as they could reach consensus on the criteria and the ranking. The supervisors reported that the main criteria they utilized (in descending order) were (1) success in classroom teaching of content, (2) student and teacher rapport in the classroom, (3) effectiveness in peer teaching in their weekly seminars, and (4) quality of instructional planning. Each of the supervisors observed in person the 97

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student teachers a minimum of two times during the year (four quarters), reviewed several of their teaching video tapes, and interacted with them regularly throughout the year in weekly rotating seminars.

Results

The first hypothesis--that student teachers' social maturity, receptivity to criticism, and ability to incorporate suggestions resulting from critiques into their subsequent teaching predict generative teaching in preactive and interactive decision-making--was analyzed by using multiple regression techniques. Results of these analyses indicated that the combined receptivity to criticism, social maturity, and incorporation of criticism predictor variables accounted for 56.68% of the variance in the preactive generative teaching scores of the student teachers. The receptivity to criticism variable was a significant source of variance ($F = 92.22$, $p<.001$, R Squared = .4926) as the first entered variable. Social maturity ($F = 56.981$, $p<.001$, R Squared Change = .052) and ability to incorporate suggestions resulting from critiques into subsequent lessons ($F = 40.565$, $p<.001$, R Squared Change = .019) were also significant sources of variance after the

variance attributable to receptivity to criticism had been removed.

Insert Table 1 about here

The same analyses were repeated using the interactive scores of the student teachers as the criterion variable. Results indicated that the combined receptivity to criticism and social maturity predictor variables accounted for 56.6% of the variance in the interactive scores of the student teachers. Receptivity to criticism was a significant source of variance ($F = 93.682$, R Squared = .4917, $p<.001$) as the first entered variable. The social maturity variable was also a significant source of variance ($F = 61.456$, R Squared Change = .0697, $p<.001$) after the variance attributable to receptivity to criticism had been removed.

Insert Table 2 about here

The second hypothesis--that the "more effective" student teachers exhibit a greater level of social maturity, receptivity to criticism, ability to incorporate criticism into subsequent teaching,

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generative teaching in the preactive domain, and generative teaching in the interactive domain than do the "less effective" student teachers--was analyzed by a multivariate ANOVA followed by univariate ANOVAs.

The student teachers in the four quartiles (most effective, effective, somewhat effective, and least effective) were compared with respect to their social maturity, receptivity to criticism, incorporation of criticism, preactive and interactive generative behavior. A multivariate ANOVA ($F_{15, 263} = 6.37$, $p<.001$) indicated that significant differences existed among the four groups with respect to the five variables.

Univariate ANOVAs followed by Tukey's HSD indicated that the most effective and the effective groups surpassed the least effective group with respect to all five variables of interest. The following results were obtained on the five variables studied:

(1) The least effective group exhibited less social maturity than the most effective and effective groups. The somewhat effective group also exhibited less social maturity than the most effective group ($F_{3,93} = 13.19$, $p<.001$).

(2) The least effective group was less receptive to criticism than the most effective group ($F_{3,93} = 3.65$, $p<.001$).

(3) The least effective group incorporated criticism into subsequent teaching less than did the most effective and effective groups ($F_{3,93} = 9.10$, $p<.001$).

(4) The least effective group was the least generative in their preactive scores. The somewhat effective group was less generative in the preactive scores than the most effective group ($F_{3,93} = 17.84$, $p<.001$).

(5) The least effective group was the least generative in their interactive scores. The somewhat effective group was less generative in their interactive scores than the most effective group ($F_{3,93} = 19.04$, $p<.001$).

Insert Table 3 about here

Discussion

This study developed a measure of generative teaching that was used to quantify relations between student teachers' personality characteristics, their

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ability to use generative teaching principles, and their teaching effectiveness. The results of the study indicated that (1) effective teaching strongly and positively related to ability to use generative teaching principles, and (2) that effective generative teaching strongly and positively related to student teachers' social maturity, receptivity to criticism, and ability to incorporate suggestions from critiques into their teaching.

These data indicate some of the critical factors in effective teaching and show how they relate to one another. First, generative teaching, as in earlier studies, again related positively to effective teaching. Second, the effective use of generative teaching profits from personality characteristics critical in changing one's behavior as a teacher. These characteristics include: (1) ability to incorporate suggestions from critiques; (2) social maturity; and (3) an openness to change.

For many student teachers, generative teaching represents a conceptual change in their approach to learning and teaching. Generative teaching places the students' conceptions and generations at the center of the learning process. Within that framework, the

teachers' activities focus on leading and directing these centrally important constructive processes of the learners.

Generative teaching also places the teachers' activities in a new perspective. Teachers no longer directly impart understanding to students through clear and interesting language. Instead, teachers function through leading learners to generate relations among subject matter concepts and between their background knowledge, their experience, and the subject matter concepts to be learned.

The learning of these concepts of teaching represent conceptual change for many student teachers. The personality characteristics measured in the study correlated with the teachers' ability to engage in conceptual change. That ability to change related to the student teachers' use of generative teaching, which increased student achievement through student generation of meaningful relations between their knowledge, experience, and subject matter.

To the extent that the findings in this study are replicated through further investigations, it appears that recommendations for teacher preparation and even teacher selection may be offered.

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Since teachers who employ generative strategies in their instructional planning seem to be more effective than those who do not, specific instruction on generative lesson planning and lesson execution might become an intrinsic part of teacher preparation programs. Teacher credential candidates could be taught a variety of procedures to facilitate the generative learning of their students. First, familiar materials taken from the students' everyday experience, familiar words, and familiar believable contexts and problems facilitate generative learning. Thus teachers could be taught through case studies how to best utilize those devices (analogies, metaphors, images, diagrams, examples, demonstrations, pictures, and paraphrases) demonstrated to have facilitated student generation. Those case studies which manifested the most creative uses of the above generative techniques and also enhancd the generation of relations between students' background knowledge and familiar content could be selected, studied, and analyzed.

Second, student teacher awareness and self-control over their own thought processes could also be taught to prospective teachers. They could learn that different types of lessons and student environments present

different types of challenges and problems which necessitate implementing different structures, different heuristics, and even different strategies. The student teacher could be encouraged to keep a "metacognitive log" of their student teaching experiences, reflecting upon and recording their own thought processes and learning as they become inducted into the profession of teaching. This might help them to develop metacognitive skills in their own students. They could periodically exchange logs with other student teachers and compare the ways they think about, examine, and apply teaching principles.

Third, student teachers could experience and be taught how to implement those learning environments that have proved most complementary to generative teaching, e.g., cooperative learning and inquiry-oriented experience-based models. For example in a recent experimental study of lower socio-economic students, training students in generative teaching strategies significantly increased their effectiveness as learners and their effectiveness as teachers of their peers in the cooperative learning classes (Kourilsky & Wittrock, 1992).

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The Mini-Society, an example of an inquiry-oriented experience-based instructional program (where students learn by doing), has been found repeatedly to result in increased knowledge acquisition, enhanced positive attitudes toward school and learning, and increased perceived responsibility (Kourilsky, 1985, 1984, 1983; Graff, 1985; Ortiz, 1986).

The Mini-Society is a natural environment for generation to occur. The youngsters (grades 3-6) create within their classrooms a society including a political system, a legal system, and an economic system. All problems and dilemmas that arise (including values clarification, legal, political, business, banking, mathematical, etc.) within the context of the Mini-Society are debriefed in classroom meetings, which are either led by the teacher or students.

In terms of teacher selection, it would be helpful to be able to--in advance of admission to a teacher education program--have information on the prospective candidate's social maturity, receptivity to criticism, and ability to incorporate critiques into subsequent lessons. Perhaps an interview protocal and/or questionnaire could be developed to ascertain the degree to which these personality characteristics related to

effective teaching were prevalent in a prospective candidate.

In sum, the results of this study suggest that "more effective" versus "less effective" teachers may indeed be distinguished by both preactive and interactive generative planning and teaching strategies as well as by personality characteristics related to the proclivity to engage in generative teaching.

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Table 1

Summary Step-wise Regression Analysis--Dependent Variable: Preactive Scores

Step	Variable Entered	Multiple R	R Square	R Square Change	Simple R	F	P
1	Receptivity to Criticism	.7018	.4926	.4926	.7018	92.22	.000
2	Social Maturity	.7410	.5478	.0552	.6765	56.941	.000
3	Incorporating Criticism	.7529	.5668	.0190	.6499	40.565	.000

Table 2

Summary Step-wise Regression Analysis--Dependent Variable: Interactive Scores

Step	Variable Entered	Multiple R	R Square	R Square Change	Simple R	F	P
1	Receptivity to Criticism	.7050	.4917	.4917	.7050	93.862	.000
2	Social Maturity	.7528	.5666	.0697	.6983	61.456	.000

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Table 3

Means and Standard Deviations of Personal Characteristics and Generative Teaching by Levels of Effective Teaching

Personal Characteristics	Effective Teaching: Most Effective	Effective	Somewhat Effective	Least Effective	Univariate F values af=(3,93)
Social Maturity	4.93 (.26)	4.00 (1.06)	3.62 (1.13)	2.67 (1.11)	13.19**
Receptivity to Criticism	4.60 (.74)	4.18 (1.01)	3.97 (1.14)	3.40 (1.06)	3.65*
Incorporating Criticism	4.87 (.35)	4.12 (.86)	3.73 (1.11)	3.20 (1.01)	9.10**
Generative Teaching					
Preactive	90.37 (7.37)	75.46 (15.85)	67.67 (16.81)	47.68 (23.32)	[illegible]**
Interactive	89.07 (8.40)	76.60 (14.01)	67.27 (17.87)	48.47 (18.92)	19.04**

* p<.05

** p<.001

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